UNITED STATES PATENT AND TRADEMARK OFFICE
DOCUMENT CLASSIFICATION BARCODE SHEET

CATEGORY:

CLEARED

ADDRESS
CONTACT IF FOUND:

01-08 526 Rec'd PCT/PTO 05 JAN 2001

FORM PTO-1390 (Modified) (REV 10-95) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: AD-6580

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR): 09/743330

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/US99/17333	29 JULY 1999 (29.07.99)	30 JULY 1998 (30.07.98)

TITLE OF INVENTION

SEPARATION FINGERS FOR ELECTRO PHOTOGRAPHIC DEVICES

APPLICANT(S) FOR DO/EO/US

GEORGE, Daniel Eugene et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☑ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☑ This is an express request to being national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b)) and PCT Articles 22 and 39(1).
4. ☑ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☑ A copy of the International Application was filed (35 U.S.C. 371 (c) (2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau.
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371 (c) (2)).
7. ☑ A copy of the International Search Report (PCT/ISA/210).
8. ☑ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c) (3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
10. ☑ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☑ A copy of the International Preliminary Examination Report (PCT/IPEA/409)
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included :

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☑ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A FIRST preliminary amendment.
    A SECOND or SUBSEQUENT preliminary amendment.
16. ☐ A substitute specification.
17. ☑ A change of power of attorney and/or address letter.
18. ☑ Certificate of Mailing by Express Mail.
19. ☐ Other items or information:

17. General Power of Attorney
18. Express Mailing Label No.: EL-031052095US

mailed 1/5/01

APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/743550	PCT/US99/17333	AD-6580

20. The following fees are submitted

CALCULATIONS PTO USE ONLY

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) – (5)) :

☑ Search Report has been prepared by the EPO or JPO	$840.00	
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482)	$690.00	
☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))	$760.00	
☐ Neither international preliminary examination fee paid to USPTO (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$1000.00	
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) And all claims satisfied provisions of PCT Article 33(2)-(4)	$ 100.00	
ENTER APPROPRIATE BASIC FEE AMOUNT	=	**$840.00**
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).		**$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total Claims	3 - 20 =	0	x $18.00	**$0.00**
Independent Claims	1 - 3 =	0	x $80.00	**$0.00**
Multiple Dependent Claims **(check if applicable)**			☒	**$260.00**
TOTAL OF ABOVE CALCULATIONS			=	**$260.00**
Reduction of ½ for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).**			☐	**$0.00**
SUBTOTAL			=	**$260.00**
Processing Fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				**$0.00**
TOTAL NATIONAL FEE			=	**$1,100**
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).**			☒	**$40.00**
TOTAL FEES ENCLOSED			=	**$1,140.00**
			Amount to be : refunded	$
			Charged	$

☐ A check in the amount of _____ to cover the above fees enclosed.

☑ Please charge my Deposit Account No. **04-1928** in the amount of **$1,140.00** to cover the above fees.

☑ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **04-1928** a duplicate copy of this sheet is enclosed.

NOTE : Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (CFR 1.37(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

LANGWORTHY, JOHN A.
E. I. DU PONT DE NEMOURS AND COMPANY
LEGAL PATENT RECORDS CENTER
1007 MARKET STREET
WILMINGTON, DELAWARE 19898
UNITED STATES OF AMERICA

SIGNATURE

LANGWORTHY, JOHN A.
NAME

32,255
REGISTRATION NUMBER

DATE

TITLE

SEPARATION FINGERS FOR ELECTRO PHOTOGRAPHIC DEVICES

BACKGROUND OF THE INVENTION

Development has been done previously to realize a separation finger that will prevent the occurrence of paper jams caused by, for example, the adhesion of the toner.

There are separation fingers molded from a polyimide resin which has a coating of a tetrafluoroethylene-perfluoroalkylvinyl ether copolymer at least for the tip portion which the copying paper touches (Published Unexamined Application No.: Hei 1-72182), and a separation finger molded of a polyamideimide resin or polyphenylene sulfide resin that have a coat of a multilayer structure consisting of a primer layer and top layer of a fluororesin.

In addition to the technology to coat a fluororesin on the surfaces of separation fingers, separation fingers for Electro graphic devices made by compression-molding and sintering blends consisting of 40 to 90 wt % polyimide resin and 60 to 10 wt % fluororesin such as polytetrafluoroethylene resin (PTFE) (Published Unexamined Application No. Hei 4-102883), and separation fingers made by compression-molding blends of 30 to 90 wt % polyimide resin and 70 to 10 wt % tetrafluoroethylene-perfluoroalkyl-vinyl ether copolymer to obtain a compressed powder product for Separation fingers having configurations of 70μm or less in finger tips' inscribed circle diameter, and then sintering the powder product (Published Unexamined Application No. Hei 6-19360), have also been developed.

However, the improvement of the quality and life of copying equipment and other electro photographic devices, as well as the recent trend toward wider use of recycled paper, have made it necessary to improve separation fingers in non-adhesion to toner and wear resistance under the conditions of friction caused by toner and paper dust, and also to minimize the diameters of the tips of separation fingers. Thus, the object of this invention is to solve such problems and offer separation fingers for Electro photographic devices that have sharper tips and better wear resistance, non-adhesion of toner, and durability, without requiring fluororesin coating. Moreover, the separation fingers of this invention have outstanding durability, capable of retaining non-adhesion of toner even when their surfaces have worn.

SUMMARY OF THE INVENTION

After working actively on research to solve the above-mentioned problems, these inventors found that it was possible to provide separation fingers

having improved wear resistance and non-adhesion of toner by using polytetrafluoroethylene resin (PTFE) powder falling into certain ranges of weight-average molecular weight and average particle size, polyimide resin powder.

The separation fingers for electrophotographic devices of this invention developed to solve the above problems were characteristically obtained by compression-molding, and then sintering, blends obtained by blending polyimide resin powder and polytetrafluoroethylene resin (PTFE) powder which is 500,000 to 1,000,000 in weight-average molecular weight and 5 to 20μm in average particle size, at weight-based ratios of 70:30 to 95:5.

Other separation fingers of this invention are the above mentioned separation fingers that are characterized by their tips being 50μm or less in diameter.

Still other separation fingers of this invention are either of the above types that are characterized by the water-repelling angles of the separating finger surfaces being 100°C or more and such surface water-repelling angles being at least 90°C even when the surfaces of the separation fingers have worn to 50μm.

DETAILED DESCRIPTION OF THE INVENTION

The polyimide resin powder used in this invention is a condensation polymer, copolymer, etc, of one or more acids selected from a group consisting of pyromellitic dianhydride, 3,3',4,4'-biphenyltetra-carboxylic dianhydride, and 3,3',4,4'-benzophenonetetra-carboxylic dianhydride, and one or more diamines selected from a group consisting of 4,4'-diaminodiphenyl ether, 1,3-phenylene-diamine, and 1,4-phenylene diamine. A condensation which is a copolymer of 3,3',4,4'-biphenyltetracarboxylic dianhydride and 1,3'-phenylenediamine and 1,4'-phenylenediamine, is preferable because its thermal distortion temperature is quite high, at 340°C, and its strength and elongation are well balanced. A condensation polyimide of 4,4'-diaminodiphenyl ether and pyromellitic dianhydride is especially preferable.

The polytetrafluoroethylene resin (PTFE) powder used in this invention is 500,000 to 1,000,000 in weight-average molecular weight and 5-20μm in average particle size. Polytetrafluoroethylene resin (PTFE) can easily withstand the sintering temperature of any of the above polyimide resin powders because it has a high melting point; whereas, other known fluororesins decompose when the polyimide resin powder is sintered.

The weight-average molecular weight of the polytetrafluoroethylene resin (PTFE) powder is preferably 600,000 to 800,000, and more preferably 600, 000 to 700,000. Its average particle size is preferably 5 to 15μm, and more preferably 7

to 12μm. If its weight-average molecular weight is less than 500,000, the powder thermally decomposes at the sintering temperature of the polyimide resin, and the separation finger's performance becomes uneven. On the other hand, if the weight-average molecular weight is greater than 1,000,000, PTFE with high molecular weight melts at 327°C and sintering temperature of the polyimide in the range of 380 to 500°C, the melt viscosity is very high and the melt flow is very low, and its spread over the separation finger's surface becomes insufficient. Also, an average particle size either smaller than 5μm or larger than 20μm would result in poor dispersion and thence inability to obtain a having a good surface.

The blending ratio of the polyimide resin powder and polytetrafluoroethylene resin powder is 70:30 to 95:5 based on weight. It is preferably 80:20 to 90:10, and more preferably 85:15. If the polytetrafluoroethylene resin powder is blended at a ratio of less than 5, the powder's non-adhesion of toner would be insufficient, and if it is blended at a ratio of greater than 30, the tip strength of the separation finger would be reduced excessively.

In this invention, graphite can be blended, along with the polytetrafluoroethylene resin powder, into the polyimide resin powder to the extent that it will not affect the separation finger's performance capability. The separation finger of this invention is obtained by blending polyimide resin powder and polytetrafluoroethylene resin powder, 500,000 to 1,000,000 in weight-average molecular weight and 5 to 20 in average particle size, at a weight-based ratio of 70:30 to 95:5, and then sintering the compound. The polyimide resin and polytetrafluoroethylene resin (PTFE) powders are dry-blended. The blending must be accomplished under a set of conditions that will not cause excessive working of the polyimide resin powder. The compression-molding is normally done at a compression surface pressure of at least 40,000 psi, and the sintering is normally done at a temperature of 380to 500°C for four hours or longer to achieve complete conversion to polyimide. It is preferable to wash and barrel-grind (tumble) the material with an abrasive media after sintering so that the separation fingers have a smoother surface.

The tip diameter of the separation finger of this invention is preferably not greater than 50μm, and more preferably not greater than 30μm. When a fluororesin is coated over a separation finger made of a polyimide resin, it is extremely difficult to obtain a less-than-50μm tip diameter; whereas, in this invention, it is easier to ensure the precision of the molded article because no coating is applied.

In this invention, the water-repelling angle of the separation finger surface was used as an indicator of the non-adhesion of toner to the finger surface. Water-repelling angle was measured by dropping approx. 0.4 μl of distilled water on to the surface of the separation finger using a hypodermic needle and then measuring the contact angle using an image-processing type contact angle meter (Model CA-X 150, made by Kyowa Interface Science Co., Ltd.).

The water-repelling angle of the surface of a separation finger obtained by compression-molding and sintering a blend obtained by blending polyimide resin powder and polytetrafluoroethylene resin powder, 500,000 to 1,000,000 in weight-average molecular weight and 5 to 20μm in average particle size, at a weight-based ratio of 70:30 to 95:5 is at least 100°C, and the separation finger's surface retains a water-repelling angle of at least 90°C even when it has worn to 50μm. When a fluororesin is coated over a separation finger, the coat thickness is 30 to 50μm. By contrast, in the case of the separation fingers of this invention, the finger surface not only has non-adhesion of toner without requiring coating, but also retains non-adhesion of toner even when the surface layer has worn, and thus is more durable than a coated separating finger.

This invention is further explained below by citing examples of use; however, the applicability of this invention is not limited to these examples of use.

EXAMPLES 1-2 AND COMPARATIVE EXAMPLES 1-4

Polyimide resin powder (Vespel(registered trademark) Si'-1, made by DuPont), which is a condensation polymer of 4, 4'-diaminodiphenyl ether and pyromellitic anhydride, and polytetrafluoroethylene resin powder having the weight-average molecular weight and average particle sizes shown in Table-1 were dry-blended at a weight-based ratio of 90:10, filled into a mold for separation fingers compressed at pressures of 40,000 psi or higher, and sintered at 380 to 500°C temperature for four hours or longer. The material was washed and barrel-grind(tumble with an abrasive media) after sintering to make separation finger approx. 30μm in tip diameter. A separation finger was made under the same manufacturing conditions but using the same polyimide resin powder alone as a control.

The surfaces of the separation fingers obtained were visually observed. The results are shown in Table-1.

[Table-1]

	PTFE Wt-average Molecular wt.	PTFE Ave. particle Size (μm)	Visually observed finger surface conations
Example 1	600,000-700,000	7-12	A
Example 2	1,000,000	20	B
Comparative Example 1	80,000-90,000	2.5-4.5	C
Comparative Example 2	400,000-500,000	8-15	C
Comparative Example 3	110,000	4-12	C
Comparative Example 4	150,000-200,000	8-15	C

A: Virtually equal to Control I in surface smoothness.

B: Has some surface defects (swelling, void, etc.) compared with Control 1.

C: Has serious defects compared with Control 1.

When Examples 1 and 2 are compared with Comparative Example 1, it is found that no separation finger having a smooth surface is not obtainable if the weight-average molecular weight and average particle size of the polytetrafluoro-ethylene powder deviate from the ranges of this invention.

Also, when Examples 1 and 2 are compared with Comparative Examples 2 to 4, it is found that a separation finger having a smooth surface is not obtainable if the weight-average molecular weight of the polytetrafluoroethylene powder deviates from the range of this invention, even when the powder's average particle size is within the range of this invention, because of poor dispersion of the polytetrafluoroethylene resin powder.

EXAMPLES 3-6

Polyimide resin powder (Vespel (registered trademark) SP-1, made by DuPont), which is a condensation polymer of 4,4'-diaminodiphenyl ether and pyromellitic dianhydride, and polytetrafluoroethylene resin powder having a weight-average molecular weight of 600,000 to 700,000 and average particle size of 7 to 12μm were dry-blended at the weight-based ratios shown in Table-2, filled into a mold for separation fingers, compressed at pressures of 40,000 psi or higher, and sintered at a temperature of 380 to 500°C for four hours or longer. The material was washed and tumbled with an abrasive media (barrel-grind) after sintering to make separation fingers approx. 30μm in tip diameter. The tip

strength of the separation fingers so obtained and that of the separation finger of Control-1 were measured. Specifically, the tip strength of the separation fingers was obtained by fixing the separation finger on the base of a compression tester so that its paper-running surface would be perpendicular to the base, applying a load on the finger tip from the vertical direction, and measuring the load when the tip broke. The test results are shown in Table-2.

[Table-2]

	PI:PTFE	Tip strength at normal temp. (kgf)	Tip strength at 200°C ambient temp. (kgf)
Example 3	70:30	0.5 (-74%)	0.4 (-69%)
Example 4	80:20	0.8 (-58%)	0.6 (-54%)
Example 5	85:15	1.1 (-42%)	0.9 (-31%)
Example 6	95:5	1.2 (-37%)	1.0 (-23%)
Control 1	100:0	1.9	1.3

The numbers in ( ) represent the drops in tip strength in the various examples of use compared with the tip strength of Control 1.

When Examples 3 to 6 are compared with Control 1, it is found that the tip strength drops more when more polytetrafluoroethylene resin powder is blended, when tested either at normal temperature or at elevated temperature.

EXAMPLE 7 AND COMPARATIVE EXAMPLES 5-6

Polyimide resin powder (Vespel® SP-1, made by DuPont), which is a condensation polymer of 4,4'-diaminodiphenyl ether and pyromellitic dianhydride, and polytetrafluoroethylene resin powder having a weight-average molecular weight of 600,000 to 700,000 and average particle size of 7 to 12μm were dry-blended at a ratio of 85:15, filled into a mold for separation fingers, compressed at pressure of 40,000 psi or higher, and sintered at 380°C to 500°C temperature for four hours or longer. The material was washed and barrel-ground (tumbled with an abrasive media) after sintering to make separation fingers approx. 30μm in tip diameter. This was measured by dropping approx. 0.4μl of distilled water on to the surface of the separating finger so obtained, using a hypodermic needle, and then measuring the contact angle using an image-processing type contact angle meter (Model CA-X 150, made by Kyowa Interface Science Co., Ltd.). Further, after the surface was ground to 50μm, using 1,000 mesh water-resistant abrasive paper, the angle of contact with water was measured in a similar manner to obtain the water-repelling angle.

Also, polyimide resin powder (Vespel® SP-1, made by DuPont), which is a condensation polymer of 4,4'-diaminodiphenyl ether and pyromellitic dianhydride, was filled into a mold for separation fingers compressed at compression surface pressures of 40,000 psi or higher, and sintered at 380°C to 500°C temperature for four hours or longer. The material was washed and barrel-ground (tumbled with an abrasive media) after sintering. The water-repelling angle of the paper scrapper was similarly measured to obtain Comparative Example 5.

A coating layer -- consisting of a primer layer 10μm in average coat thickness and a top layer 20μm in average coat thickness -- was formed by applying and drying a primer of a tetrafluoroethylene/perfluoroalkylvinyl ether copolymer over the surface of a separation finger made in a similar manner as Comparative Example 5, and further spray-coating, and then sintering, a top coat of dispersed (average particle size:0.2 to 0.4μm) tetrafluoroethylene/perfluoro-alkylvinyl ether copolymer over it. The product was used as Comparative Example 6.

The water-repelling angle of the separation finger surface so obtained was similarly measured. Then, as with Example 7, the water-repelling angle of the surface was measured after grinding it to 50μm using 1,000-mesh water resistant abrasive paper. The water-repelling angle test was run three time for each to obtain the average value. The results are shown in Table-3.

[Table-3]

	Water-repelling angle (contact angle of water) (deg.)	Water-repelling angle of surface after 50μm grinding (deg.)
Example 7	107.4	100.9
Comparative Example 5	81.7	-
Comparative Example 6	107.3	74.7

When Example 7 and Comparative Example 5 are compared, it is found that the blending of polytetrafluoroethylene resin powder results in higher water repellency of the surface of the separation finger. This is believed to indicate improved non-adhesion of toner.

When Example 7 and Comparative Example 6 are compared, it is found that the surface of the separation finger of this invention has equal non-adhesion of toner as when a fluororesin is coated. It is also found that the separation finger of this invention retains outstanding non-adhesion of toner even when its surface is

ground to 50μm, but that a separation finger coated with a fluororesin loses its non-adhesion because the maximum possible coat thickness of such a finger is approximately 50μm.

EXAMPLE 8

A paper running test was conducted by installing the separation finger of Example 1 on a commercially available medium-speed photocopying device and running size A-4 copying paper at a rate of 30 sheets/min. No troubles such as toner adhesion or tip wear occurred with the finger even when 100,000 sheets had been run, nor did the tip cause any scratches on the fixed roll which it touches directly.

CLAIMS:

1. A separation finger for Electro photographic devices, being formed by compression-molding a blend of polyimide and polytetrafluoroethylene resin powders, followed by sintering the blend, characterized by the weight-based blending ratio of said polyimide resin powders and polytetrafluoroethylene resin powders being 70:30 to 95:5 and said polytetrafluoroethylene resin powder being 500,000 to 1,000,000 in weight-average molecular weight and 5 to 20μm in average particle size.

2. The separation finger of Claim 1 wherein diameters of tips are 50μm or less.

3. The separation finger of Claim 1 or 2 wherein the water-repelling angles of the surfaces of the separation finger are 100°C or more and such surface water-repelling angles being at least 90°C even when the surface of the separation finger have worn to 50μm.

GENERAL POWER OF ATTORNEY
(Concerning Several International Patent Applications)

The undersigned, Vernon R. Rice, Vice President and Assistant General Counsel of E. I. DU PONT DE NEMOURS AND COMPANY, 1007 Market Street, Wilmington, Delaware 19898 USA ("DuPont"), hereby confirms that the power to sign for DuPont has been granted to various individuals (as set forth in the attached excerpt from DuPont's Patent Board Rules of Procedure (January 1988), Appendix Section III.A.4), including the Chairman, Vice-Chairman, and those individuals who are Assistant Secretaries of the Patent Board. Currently these Assistant Secretaries are:

Roger A. Bowman	Miriam D. Meconnahey
Linda J. Davis	Dorothy W. Shafer
John E. Griffiths	Deborah A. Meginniss

In addition, the authority to act on behalf of DuPont before the competent International Authorities in connection with any and all international patent applications filed by it with the United States as Receiving Office and to make or receive payments on its behalf is hereby granted to:

Beardell, Lori Y.	34,293	Katz, Elliott A.	26,396
Belopolsky, Inna	43,319	Kelly, Patricia L.	39,247
Benjamin, Steven C.	36,087	King, Karen K.	34,850
Birch, Linda D.	38,719	Kuller, Mark D.	31,925
Bowen, Jr., Alanson G.	24,027	Krukiel, Charles E.	27,344
Christenbury, Lynne M.	30,971	Jarnholm, Arne R.	30,396
Cotreau, William J.	36,490	Langworthy, John A.	32,255
Deitch, Gerald E.	30,457	Lerman, Bart E.	31,897
Deshmukh, Sudhir	33,677	Levitt, Cary A.	31,848
Dobson, Kevin S.	40,296	Magee, Thomas H.	27,355
Duffy, Roseanne R.	33,869	Mayer, Nancy S.	29,190
Edwards, Mark A.	39,542	Medwick, George M.	27,456
Estrin, Barry	26,452	Morrissey, Bruce W.	30,663
Evans, Craig H.	31,825	Santopietro, Lois A.	36,264
Fair, Tamera L.	35,867	Schaeffer, Andrew L.	33,605
Feltham, S. Neil	36,506	Sebree, Chyrrea J.	45,348
Floyd, Linda Axamethy	33,692	Shafer, Robert J.	24,437
Frank, George A.	27,636	Shay, Lucas K.	34,724
Golian, Andrew G.	25,293	Shipley, James E.	32,003
Gorman, Thomas W.	31,959	Siegell, Barbara C.	30,684
Gould, David J.	25,338	Sinnott, Jessica M.	34,015
Griffiths, John E.	32,647	Steinberg, Thomas W.	37,013
Hamby, Jane O.	32,872	Stevenson, Robert B.	26,039
Hamby, William H.	31,521	Strickland, Frederick D.	39,041
Heiser, David E.	31,366	Tessari, Joseph A.	32,177
Hendrickson, John S.	30,847	Tulloch, Rebecca W.	36,297
Jones, Brian C.	37,857	Walker, P. Michael	32,602
Joung, J. Kenneth	41,881	Wang, Chen	38,650

The undersigned ratifies fully all actions already taken by the above-named individuals in accordance with the authority granted hereby.

E. I. DU PONT DE NEMOURS AND COMPANY

By: _____
Vernon R. Rice
Vice President and Assistant General Counsel

Date: 5/1/2000

Rev. 06/95

Docket Number
AD6580

DECLARATION and POWER OF ATTORNEY

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SEPARATION FINGERS FOR ELECTRO PHOTOGRAPHIC DEVICES

the specification of which is attached hereto unless the following box is checked:

■ was filed on **29 JULY 1999** as U.S. Application No. _____ or PCT International Application No. **PCT/US99/17333** and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is known to me to be material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Application No.	Country	Filing Date	Priority Claimed (Yes/No)
98/216000	JAPAN	30 JULY 1998	Yes

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States Provisional Application(s) listed below.

U.S. Provisional Application No.	U.S. Filing Date

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International Application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application or PCT International Application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is known to me to be material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Application No.	Filing Date	Status (patented, pending or abandoned)

POWER OF ATTORNEY: I hereby appoint the following attorney(s) and/or agent(s) the power to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

Name: INNA Y. BELOPOLSKY — Registration No.: 43,319

Send correspondence and direct telephone calls to:		
INNA Y. BELOPOLSKY	**E. I. du Pont de Nemours and Company** **Legal - Patents** **Wilmington, DE 19898, U.S.A.**	**Tel. No.** (302) 992-4362 **Fax No.** (302) 992-3257

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

INVENTOR(S)

1-00 **Full Name of Inventor**	Last Name: **GEORGE**	First Name: **DANIEL**	Middle Name: **EUGENE**	
	Signature (please sign full name): Daniel Eugene George		Date: Oct. 4, 1999	
Residence & Citizenship	City: **CHADDS FORD**	State or Foreign Country: **PENNSYLVANIA**	Country of Citizenship: **U.S.A.** PA	
Post Office Address	Post Office Address: **3 BYRON COURT**	City: **CHADDS FORD**	State or Country: **PENNSYLVANIA**	Zip Code: **19317**
2-00 **Full Name of Inventor**	Last Name: **NAKAGAWA**	First Name: **SHINICHI**	Middle Name:	
	Signature (please sign full name): Shinichi Nakagawa		Date: September 30, 1999	
Residence & Citizenship	City: **UTSUNOMIYA-SHI, TOCHIGI**	State or Foreign Country: **JAPAN**	Country of Citizenship: **JP** JPX	
Post Office Address	Post Office Address: **MARTUA HEIGHTS II 205, 631-15, IMAIZUMI-CYO**	City: **UTSUNOMIYA-SHI, TOCHIGI**	State or Country: **JAPAN**	Zip Code: **321-09262**
3-00 **Full Name of Inventor**	Last Name: **YOKOYAMA**	First Name: **AKIRA**	Middle Name:	
	Signature (please sign full name): Akira Yokoyama		Date: September 30, 1999	
Residence & Citizenship	City: **UTSUNOMIYA-SHI, TOCHIGI**	State or Foreign Country: **JAPAN**	Country of Citizenship: **JP** JPX	
Post Office Address	Post Office Address: **CHISAN-MANSYON-CYUOUKOUEN 204, 4-12 MUTUMI-CHO**	City: **UTSUNOMIYA-SHI, TOCHIGI**	State or Country: **JAPAN**	Zip Code: **321-0864**

☐ Additional Inventors are being named on separately numbered sheets attached hereto.